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This thesis determined that a model could be developed to forecast the impact of the closure or restructure of a military installation on a regional economy. The closure of a military base can have a significant effect on a community, and the impacts are required by the National Environmental Protection Act to be estimated before legislative action can be passed.

The research examined the theories of economic impact and multiplier effects. The principles of shift share analysis were further investigated and applied to the industries of the national and Monterey County economies. An average employment multiplier was derived and used in the development of an alternate economic impact forecast model. The research also applied other commercially available economic impact forecast modelsto the data associated with the base closure at Fort Ord, California, and the forecasts agreed that the county economy would suffer considerably in the short term. The selected model was then applied to two redevelopment options and the results predicted that the county economy would improve greatly in the long term after the initial slump.

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THE ECONOMIC IMPACT OF MILITARY INSTALLATIONS ON REGIONAL ECONOMIES

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ABSTRACT

This thesis determined that a model could be developed to forecast the impact of the closure or restructure of a military installation on a regional economy. The closure of a military base can have a significant effect on a community, and the impacts are required by the National Environmental Protection Act to be estimated before legislative action can be passed. The research examined the theories of economic impact and multiplier effects. The principles of shift share analysis were further investigated and applied to the industries of the national and Monterey County economies. An average employment multiplier was derived and used in the development of an alternate economic impact forecast model. The research also applied other commercially available economic impact forecast models to the data associated with the base closure at Fort Ord, California, and the forecasts agreed that the county economy would suffer considerably in the short term. The selected model was then applied to two redevelopment options and the results predicted that the county economy would improve greatly in the long term after the initial slump.

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I. INTRODUCTION

The perceived end of the 'cold war', continuing spread of democracy throughout the world, and increased budget pressures have prompted many nations to restructure and reduce the size of their military forces. Force manpower reductions normally lead to reductions in the number or size of military installations (or bases). Federal, state, local and military authorities are concerned that moving or closing military bases may cause significant spillover effects on the regional economies in which the military bases exist. This research will focus on the local or regional impact of military spending and military and civilian employment by using the example of a specific base targeted for closure.

A. PURPOSE OF THE RESEARCH

Military spending and military-sponsored employment causes impacts on the national, state and regional economies in which military bases are located. Many areas of military spending impact on the community. Among these are the procurement of supplies and services by the military, employment by the military of uniformed and civilian personnel and the consumption of goods and services by personnel on military payrolls.

Although these general impacts are well known and attract much discussion, Buckley revealed that the exact economic impacts of military spending on a community are not as well known [Ref. 1]. Previous studies by Young [Ref. 2] have addressed this issue and provide a well-developed path and methodology for further research in this area. Therefore, this research will briefly examine the theories of economic impact and further investigate the economic impacts of the military on domestic regional economies developed by focussing on the military installation at Fort Ord within the region of Monterey County, California.

B. THE RESEARCH QUESTION

The primary question prompting this research is: what elements are necessary to develop prototype models to assess accurately the impact of domestic military installations on their local economies? The developed model should be subject to theoretical criticism and further refinement, and the data required to run the model should be readily accessible from published government sources for every region in the United States.

C. SCOPE, LIMITATIONS, AND ASSUMPTIONS OF RESEARCH

The main economic region considered to be influenced by Fort Ord is limited to Monterey County and the Marina-Monterey-Salinas-Seaside metropolitan area. The scope of this

study is limited to the Fort Ord military installation, as Fort Ord is the largest military installation in the region and is the most affected by the base conversion legislation. Other military installations in the region include the Naval Postgraduate School and the Defence Language Institute at the Presidio of Monterey.

The research was limited to model development based on economic base theory. This theory and its underlying assumptions were drawn from Oppenheim [Ref. 3]. The other main limitation of the research was the reliance on published government data from county, state and national sources. Independent surveys of businesses and employment agencies or consumption and expenditure patterns were not undertaken in the course of this research. Other assumptions associated with calculations are revealed and discussed throughout the study.

Data collection was mainly from published sources including the State of California Departments of Employment Development [Ref. 4] and Transportation [Ref. 5], the Monterey County Planning Department [Ref. 6], the Monterey Peninsula Chamber of Commerce [Ref. 7] and the Association of Monterey Bay Area Governments [Ref. 8]. Data on Fort Ord were obtained from the Facilities Engineer and the Fort Ord Task Force [Ref. 9].

D. ORGANIZATION OF THE STUDY

The review of literature relevant to the study and the collection of data for the research is covered in Chapter II. An analysis of the Monterey County economy using economic base theory, shift-share analysis, multiplier effects, input-output analysis and other economic impact models follows in Chapter III. An alternate impact model is then developed and applied to Monterey County and a comparison with the other models follows in Chapter IV. Chapter V then analyzes the economic impacts of the main alternate uses proposed for Fort Ord and their effects on Monterey County. Finally, the conclusions derived from the research are contained in Chapter VI.

II. LITERATURE REVIEW AND DATA COLLECTION

This review of literature relevant to the economic impact of military bases on regional economies is conducted in two parts: one, a historical perspective of military base restructuring, and two, academic research into economic impacts of military bases. Then, the procedures and sources involved in the collection of data for this study are described.

A. HISTORY OF MILITARY BASE RESTRUCTURING

In March 1961, the administration of President John F. Kennedy began the first significant reorganization and consolidation of military bases since World War II. From 1961 to 1969, Buckley [Ref. 1:p. 1] states, over 1100 military activities were affected. According to Lynch [Ref. 10:p. 8], 211,017 civilian and military positions were eliminated during the period resulting in cost savings of $1.5 billion per year.

Since the military services reached their peak manning levels during the Vietnam conflict, reductions in military and civilian defense personnel resulted in the elimination of 1,650 U.S. defense installations worldwide up to 1978 [Ref. 11:p. 37].

The economic impact of the base closures and reductions on local communities were well recognized by the communities involved and they often testified at Senate Commerce Committee hearings to prevent or minimize the actions. However, Lynch [Ref. 10] reports that the official response from the Secretary of Defense was that the Pentagon was not responsible for local economic demand maintenance and it could not depart from the standard of military effectiveness to aid a distressed area. The communities were rescued to a limited extent by the National Environmental Protection Act of 1969. The Act and subsequent court decisions have resulted in defense consideration of socioeconomic environmental impacts on communities affected by base closures and realignment actions. In 1976, U.S. Congress passed the Military Construction Authorization Bill which requires Congress to be notified that a base is a candidate for reduction or closure. For the next ten years, all attempts at closing major installations failed and not one major base closure occurred.

This situation caused the Secretary of Defense to establish a Commission on Base Realignment and Closure in 1988. This Commission recommended the closure or realignment of 145 installations, including 86 full closures, for an annual saving of $693.6 million and the elimination of 12,796 civilian and military jobs [Ref. 12]. Fort Ord was not recommended for closure by the Commission.

In January 1990, after further review, the Secretary of Defense announced that Fort Ord was to be included in the list of installations to close and the 7th Infantry Division (Light) was to move to Fort Lewis, Washington.

B. ACADEMIC RESEARCH

Academic research into the economic environmental impact of military bases has been only limited, despite the extensive requirements of the Environmental Protection Act. In the major studies conducted, economic base analysis and specific case studies have been the preferred method of research.

Buckley [Ref. 1] surveyed the various studies through 1976 using economic base theory which developed employment or income multipliers. His analysis included studies by Weiss and Gooding (1968), Sasaki (1963), Garrison (1972), and Lynch (1969).

Lynch's research used economic base theory, location quotients and employment multipliers to determine the impact of changes in military and federal civilian employment on 15 communities [Ref. 10:pp. 8-18]. The areas of impact studied were local employment, retail sales, housing and local government finances. Lynch found a high multiplier for Federal civilian employment (3.58) and a low multiplier for military employment (1.662). He also found significant impact on low-cost housing and local government revenues.

Buckley also noted a major study by V. Howard Savage (1974) in which input/output analysis was used to determine economic impact on the interdependence of the San Antonio, Texas economic structure and defense establishment. This study used a 66 sector input/output table and yielded an employment multiplier of 2.06 and an income multiplier of 2.00. The Battelle Institute also conducted an input/output study for the Office of Economic Analysis on the economic impact of Badger Army Ammunition Plant in south central Wisconsin. An income multiplier of 1.27 and an employment multiplier of 1.23 were found in that study [Ref. 1:pp. 21-25]. The multipliers are summarized below in Table I.

TABLE I
MULTIPLIER RESEARCH

RESEARCHER/REGION	MULTIPLIER TYPE	MULTIPLIER
LYNCH	FEDERAL CIVILIAN EMPLOYMENT	3.58
- 15 COMMUNITIES	MILITARY EMPLOYMENT	1.662
HOWARD SAVAGE	INCOME	2.00
- SAN ANTONIO, TEXAS	EMPLOYMENT	2.06
BATELLE INSTITUTE	INCOME	1.27
- WISCONSIN	EMPLOYMENT	1.23

SOURCE: BUCKLEY, LYNCH

The U.S. Army Corps of Engineers' Construction Engineering Research Laboratory (CERL) developed their Economic Impact Forecast System (EIFS) model in 1976 with the goal of providing a basis to consider efficiently and expeditiously

the socioeconomic impacts for a wide range of project alternatives [Ref. 13:p. 7]. The initial model suffered from a high degree of overstatement in the system's estimates of economic impacts, however further refinements to the model have resulted in the more accurate prediction of multipliers when compared to results indicated by more expensive alternative techniques. The EIFS model is discussed and applied in Chapter III.

C. DATA COLLECTION

The data collected for this research were obtained from many diverse sources. Most data were collected from primary sources, and the secondary source data were verified from other sources for accuracy. National data were gleaned from the 1980 and 1990 national censuses and the Bureau of Labor Statistics [Ref. 14]; state data from the Departments of Employment Development and Transportation; and regional (county) data from the Monterey County Planning Department, the Fort Ord Task Force and the Association of Monterey Bay Area Governments (AMBAG). The data on Fort Ord were obtained from the Facilities Engineer and the Fort Ord Task Force.

A description of the types of data obtained from each source is listed below.

1. National Data

The national data required for this research were obtained from the 1980 and 1990 national censuses and the Bureau of Labor Statistics. They include personal income details, employment statistics, and distribution of population by age, location, and racial mix.

2. State Data

Data from the State of California required for this research include: population distributions, state subventions and revenues from the Department of Finance; school enrolment from the Department of Education; and employment status from the Employment Development Department.

3. Regional Data

Data relevant to Monterey County required for this research include: geographical areas, sales summaries and expenditures by type from the Monterey Peninsula Chamber of Commerce; population distributions, income and employment details from AMBAG; population growth projections and housing needs and vacancies from the Monterey County Planning Department; and income sources from CERL.

4. Military Data

The military data describing Fort Ord and its population's distribution, income, expenditure patterns and projections were obtained from the Fort Ord Task Force and the

Facilities Engineer at Fort Ord. National military data were obtained from DoD publications [Ref. 15:p. 3].

III. ANALYSIS OF IMPACTS ON MONTEREY COUNTY ECONOMY

This chapter will analyze the aspects of the economy of Monterey County relevant to the Fort Ord base realignment. It will also analyze the impacts of Fort Ord on the county's economy using existing economic impact models and report findings of recent economic impact studies.

The analytical techniques chosen to study the county economy are referred to as shift share analysis and multipliers. These techniques are concerned with the relative importance of a region's industries compared to the national economy. The following sections describe the concepts of each technique and measure the effects within the county.

A. SHIFT SHARE ANALYSIS

1. Shift Share Analysis Concept

Shift share analysis separates total growth of employment, income or output in a region into growth components, which then allow analysis of the difference in growth between regions. Herzog and Olsen (1977) describe the components of classical shift share analysis as: the change in national employment (national growth); the change in relative employment between industries (industry mix); and the relative

share of an industry in a region compared to the total industry (industry share) [Ref. 16:p. 441].

A simple example of shift share terminology can be provided by a sports analogy. The total growth in attendance at all sporting events is called the national growth factor. The proportion of total attendance at baseball games compared to all other sporting events is called the industry mix factor. The attendance at San Francisco Giants games compared to all baseball games is the industry share factor. Shift share analysis then divides the change in attendance at the Giants games into the three categories: some change is caused by changes in national sports attendance, some change is caused by changes in baseball attendance, and some change is caused by spectators choosing another baseball team to watch.

2. Shift Share Analysis of Monterey County Economy

The formula for shift share analysis was described by Herzog and Olsen [Ref. 16:p. 442] and Bendavid [Ref. 17:p. 453]. The basic shift share formula is:

$$R = N + M + S + A$$

where:

R is the total change in regional employment in an industry,

N is the total change in employment in an industry in a region due to the change in total national industry employment,

M is the total change in regional industrial employment due to greater national industry change than change in total national employment,

S is the change in employment due to the change in industry employment in the region compared to industry employment in the nation if the industry mix in the region was the same as the industry mix in the nation, and

A is the change in employment due to the change in industry employment in the region compared to industry employment in the nation less the share effect based on industry mix.

A measure of economic growth for the region was necessary to conduct this analysis, so Young [Ref. 2:p. 93] recommended the selection of employment change as the surrogate measure of economic growth in the region due to the direct relationship between the two concepts. Next, the sectors of the economy were selected to conduct the analysis. The criteria for selection include their relative importance to the economy, and the availability of disaggregated data for the selected industries.

Fourteen sectors were chosen for the analysis of the Monterey County economy. Manufacturing, trade and government were divided into separate areas due to their individual effects on the economy: durable goods manufacturing; non-durable goods manufacturing, further divided into food processing and other non-durables; wholesale trade, and retail trade sectors; and government industry divided into federal civilian, federal military, and state and local government sectors. The sources of data for the sectors are displayed in Table II. The time period selected for the analysis was 1980-1990, which was as current as data sources allow and sufficiently short to minimize structural change in employment.

TABLE II
SHIFT SHARE SECTORS
AND DATA SOURCES
(WITH ABBREVIATIONS)

INDUSTRY	NATIONAL SOURCE	REGIONAL SOURCE
AGRICULTURE (AGRI)	A	D
CONSTRUCTION (CONST)	B	D
MINING	B	D
DURABLE GOODS MANUFACTURING (DUR MFG)	B,C	D
NON-DURABLE GOODS MANUFACTURING LESS FOOD AND KINDRED GOODS MANUFACTURING (NON-DUR)	B,C	D
FOOD AND KINDRED (FOOD+)	B,C	D
TRANSPORTATION, COMMUNICATIONS, AND PUBLIC UTILITIES (TCPU)	B	D
WHOLESALE TRADE	B	D
RETAIL TRADE	B	D
FINANCE, INSURANCE, AND REAL ESTATE (FIRE)	B	D
SERVICES	B	D
GOVT - FEDERAL CIVILIAN (FED CIV)	B	D
GOVT - FEDERAL MILITARY (FED MIL)	E	F
GOVT - STATE AND LOCAL (STATE+LO)	B	D

SOURCES:
A - EMPLOYMENT AND EARNINGS 1980/1990 TABLE A-21
BUREAU OF LABOR STATISTICS
US DEPT OF LABOR
B - EMPLOYMENT AND EARNINGS 1992 TABLE B-1
BUREAU OF LABOR STATISTICS
C - EMPLOYMENT AND EARNINGS 1980/1990 TABLE B-2
D - WAGE AND SALARY EMPLOYMENT BY INDUSTRY 1980-1990
SALINAS-SEASIDE-MONTEREY METROPOLITAN AREA
CALIFORNIA EMPLOYMENT DEVELOPMENT DEPT. 1991
E - MILITARY MANPOWER STATISTICS 1980/1990 TABLE 1
DEPARTMENT OF DEFENSE
F - ECONOMIC IMPACT FORECAST SYSTEM
CONSTRUCTION ENGINEERING RESEARCH LABORATORY

3. Shift Share Tables for Monterey County

a. Employment Change

The number of people employed in full-time jobs in Monterey County and the nation changed over the ten years between 1980 and 1990. The national service sector grew by 57% or 10.3 million jobs, and the county service sector grew by 46% or 9,100 jobs to 28,700 jobs. The national agricultural industry lost 200,000 jobs (6.3%), however the county agricultural industry grew by 8,500 jobs (39.2%) to 30,200 jobs during the same period. Table III shows the change in national and Monterey County employment between 1980 and 1990 in absolute and percentage terms.

TABLE III
CHANGE IN EMPLOYMENT
MONTEREY COUNTY
1980 - 1990

	NATIONAL EMPLOYMENT ('000,000)				COUNTY EMPLOYMENT ('000)			
INDUSTRY	1980	1990	CHG	CHG %	1980	1990	CHG	CHG %
AGRI	3.2	3.0	-.2	-6.3	21.7	30.2	8.5	39.2
CONSTRUC	4.4	5.1	.7	15.9	3.3	4.6	1.3	39.4
MINING	1.0	.7	-.3	-30.0	.4	.3	-.1	-25.0
DUR MFG	12.1	10.9	-1.2	-9.9	2.4	3.7	1.3	54.2
NON-DUR	6.7	6.2	-.5	-7.5	2.5	2.9	.4	16.0
FOOD+	1.7	1.7	0	0	4.0	3.8	-.2	-5.0
TCPU	5.1	5.8	.7	13.7	5.2	4.7	-.5	-9.6
WHOLESALE	5.3	6.2	.9	17.0	3.3	5.3	2.0	60.6
RETAIL	15.1	19.7	4.6	30.5	19.4	24.9	5.5	28.4
FIRE	5.2	6.7	1.5	28.8	4.4	6.3	1.9	43.2
SERVICES	17.9	28.2	10.3	57.5	19.6	28.7	9.1	46.4
FED CIV	2.9	3.1	.2	6.9	7.3	9.0	1.7	23.3
FED MIL	2.1	2.0	-.1	-4.8	21.0	21.6	.6	2.9
STATE+LO	13.4	15.2	1.8	13.4	16.6	19.0	2.4	14.4
TOTAL	96.1	114.5	18.4	19.1	131.1	165.0	33.9	25.9

SOURCE: See TABLE II

b. National Growth Effect

The national growth effect calculates the number of jobs in each industry in Monterey County which would have been created (or lost) if each of the industries had grown at the national average rate of 19.1% between 1980 and 1990. Overall in the county 25,039 new jobs would have been created: agriculture would have grown by 4,145 jobs and the service sector would have grown by 3,744 jobs. The number of new jobs attributable to national growth for each industry in Monterey County are detailed in Table IV.

TABLE IV
NATIONAL GROWTH EFFECT
MONTEREY COUNTY
1980 - 1990

INDUSTRY	COUNTY EMPLOYMENT 1980	NATIONAL GROWTH EFFECT N
AGRICULTURE	21,700	4,145
CONSTRUCTION	3,300	630
MINING	400	76
DUR MFG	2,400	458
NON-DUR MFG	2,500	478
FOOD + KINDRED	4,000	764
TCPU	5,200	993
WHOLESALE	3,300	630
RETAIL	19,400	3,705
FIRE	4,400	840
SERVICES	19,600	3,744
FED CIV	7,300	1,394
FED MIL	21,000	4,011
STATE + LOCAL	16,600	3,171
TOTAL	131,000	25,039

SOURCE:
AUTHOR
Note: National Growth Rate 19.1% x Column 1 = N

c. Industry Mix Effect

The industry mix effect corrects for the fact that national growth was not 19.1% in all industries: 19.1% was an average growth rate. The industry mix effect modifies the national growth effect for each industry by the deviation in industry growth rates in each industry from the national average. For example, the national service industry grew by 57.5%, which was 38.4% higher than the national average industry growth rate. When the 38.4% is applied to the Monterey county service industry of 19,600 personnel, 7,526 new jobs can be explained by the national mix of industries. Overall, the county experienced a net loss of 4,980 jobs in terms of industry mix. Table V displays the industry mix effect for each industry.

TABLE V
INDUSTRY MIX EFFECT
MONTEREY COUNTY
1980 - 1990

INDUSTRY	NATIONAL INDUSTRY GROWTH RATE (%)	DEVIATION FM NAT'L GROWTH RATE (%)	COUNTY EMPLOY 1980	INDUSTRY MIX EFFECT M
AGRICULTURE	-6.3	-25.4	21,700	-5,512
CONSTRUCTION	15.9	-3.2	3,300	-106
MINING	-30.0	-49.1	400	-196
DUR MFG	-9.9	-29.0	2,400	-696
NON-DUR MFG	-7.5	-26.6	2,500	-665
FOOD + KINDRED	0	-19.1	4,000	-764
TCPU	13.7	-5.4	5,200	-281
WHOLESALE	17.0	-2.1	3,300	-69
RETAIL	30.5	11.4	19,400	+2,212
FIRE	28.8	9.7	4,400	+427
SERVICES	57.5	38.4	19,600	+7,526
FED CIV	6.9	-12.2	7,300	-891
FED MIL	-4.8	-22.9	21,000	-5,019
STATE + LOCAL	13.4	-5.7	16,600	-946
TOTAL	19.1	0	131,100	-4,980

SOURCE: AUTHOR
Note: Column 2 = Column 1 - 19.1%
M = Column 2 x Column 3

d. Regional Share Effect

The regional share effect measures the proportion of jobs created by the industries in the region gaining a larger share of the total of their industry. To prevent this effect from being biased by the structure of industry in the county, the national industry structure was superimposed on the county employment before the calculations were made. For example, the construction industry had a net gain of 1,416 jobs and the county had a net gain of 16,530 jobs attributable

to the regional share effect. The regional share effect calculations are shown in Table VI.

TABLE VI
REGIONAL SHARE EFFECT
MONTEREY COUNTY
1980 - 1990

INDUSTRY	NATL IND STRU %	COUNTY IND W/NATL STRUC	COUNTY IND GROWTH RATE %	NATL IND GROWTH RATE %	DIFF %	SHARE EFFECT S
AGRI	3.3	4,326	39.2	-6.3	+45.5	+1,968
CONSTRUC	4.6	6,031	39.4	15.9	+23.5	+1,416
MINING	1.0	1,311	-25.0	-30.0	+5.0	+66
DUR MFG	12.6	16,519	54.2	-9.9	+64.1	+10,589
NON-DUR	7.0	9,177	16.0	-7.5	+23.5	+2,157
FOOD +	1.8	2,360	-5.0	0	-5.0	-118
TCPU	5.3	6,948	-9.6	13.7	-23.3	-1,620
WHOLESALE	5.5	7,210	60.6	17.0	+43.6	+3,144
RETAIL	15.7	20,583	28.4	30.5	-2.1	-432
FIRE	5.4	7,079	43.2	28.8	+14.4	+1,019
SERVICES	18.6	24,385	46.4	57.5	-11.1	-2,707
FED CIV	3.0	3,933	23.3	6.9	+16.4	+644
FED MIL	2.2	2,884	2.9	-4.8	+7.7	+222
STATE + LO	13.9	18,223	14.4	13.4	+1.0	+182
TOTAL	100.0	131,100	25.9	19.1	+12.6	+16,530

SOURCE: AUTHOR
Notes: Column 5 = Column 3 - Column 4
S = Column 2 x Column 5

e. The Allocation Factor

The regional share effect is modified by the allocation factor to correct for the fact that the county industries were structured differently from the nation. The difference between real and hypothetical 1980 employment in each industry is multiplied by the same differential growth rates used for the regional share effect to calculate the

allocation effect. The durable goods manufacturing industry had a net loss of 9,050 jobs and the county had a net loss of 2,681 jobs explained by the allocation effect. The allocation effect for Monterey County is shown in Table VII.

TABLE VII
ALLOCATION EFFECT
MONTEREY COUNTY
1980 - 1990

INDUSTRY	COUNTY IND EMPLOY	COUNTY IND W/NATL STRUC	DIFF IND - IND W/NATL STRUC	COUNT/ NATL IND GROWTH DIFF	ALLOC. EFFECT A
AGRI	21,700	4,326	17,374	45.5	+7,905
CONSTRUC	3,300	6,031	-2,731	23.5	-642
MINING	400	1,311	-911	5.0	-46
DUR MFG	2,400	16,519	-14,119	64.1	-9,050
NON-DUR	2,500	9,177	-6,677	23.5	-1,569
FOOD +	4,000	2,360	1,640	-5.0	-82
TCPU	5,200	6,948	-1,748	-23.3	+407
WHOLESALE	3,300	7,210	-3,910	43.6	-1,705
RETAIL	19,400	20,583	-1,183	-2.1	+25
FIRE	4,400	7,079	-2,679	14.4	-386
SERVICES	19,600	24,385	-4,785	-11.1	+531
FED CIV	7,300	3,933	3,367	16.4	+552
FED MIL	21,000	2,884	18,116	7.7	+1,395
STATE + LO	16,600	18,223	-1,623	1.0	-16
TOTAL	131,100	131,100	0	+6.8	-2,681

SOURCE: AUTHOR
Note: A = Column 3 x Column 4

f. Summary of Shift Share Analysis

As previously described in the general equation, R = N + M + S + A, the change in local employment can be attributed to changes in national growth, industry mix, regional share, and allocation components. In the agricultural

industry, total employment change (R) in Monterey County was +8,500 jobs from 1980 to 1990. The national growth component (N) of that change was +4,145, the industry mix component (M) was -5,512, the regional share component (S) was +1,968, and the allocation effect (A) was +7,905. A summary of the shift share analysis for each industry and for the Monterey County region is presented in Table VIII.

TABLE VIII
SHIFT SHARE ANALYSIS
SUMMARY
MONTEREY COUNTY
1980 - 1990

INDUSTRY	EMPLOYMENT CHANGE	NATIONAL GROWTH N	INDUSTRY MIX M	REGIONAL SHARE S	ALLOCATION EFFECT A
AGRI	8,500	4,145	-5,512	+1,968	+7,905
CONSTRUC	1,300	630	-106	+1,416	-642
MINING	-100	76	-196	+66	-46
DUR MFG	1,300	458	-696	+10,589	-9,050
NON-DUR	400	478	-665	+2,157	-1,569
FOOD +	-200	764	-764	-118	-82
TCPU	-500	993	-281	-1,620	+407
WHOLESALE	2,000	+630	-69	+3,144	-1,705
RETAIL	5,500	+3,705	+2,212	-432	+25
FIRE	1,900	+840	+427	+1,019	-386
SERVICES	9,100	+3,744	+7,526	-2,707	+531
FED CIV	1,700	+1,394	-891	+644	+552
FED MIL	600	+4,011	-5,019	+222	+1,395
STATE + LO	2,400	+3,171	-946	+182	-16
TOTAL	33,900	+25,039	-4,980	+16,530	-2,681

SOURCE: AUTHOR

4. Analysis of Shift Share

Shift share analysis allows us to determine whether particular industries are specialized and/or have a competitive advantage. Herzog and Olsen [Ref. 16:p. 445] described the possible effects and how they are determined. The sign (+/-) of the allocation effect is described in Table VIII. The specialization of each industry in a region is positive when that industry in a region employs a greater share of the total employment in a region than would exist if the region employed persons in the same structure as the nation. A competitive advantage exists when an industry's growth rate in a region is higher than for that industry in the nation. A summary of the specialization and comparative advantage components is listed in Table IX.

TABLE IX
SPECIALIZATION AND COMPETITIVE ADVANTAGE
OF INDUSTRIES
MONTEREY COUNTY
1980 - 1990

INDUSTRY	ALLOCATION EFFECT	SPECIALIZATION	COMPETITIVE ADVANTAGE
AGRI	+	+	+
CONSTRUC	-	-	+
MINING	-	-	+
DUR MFG	-	-	+
NON-DUR	-	-	+
FOOD +	-	+	-
TCPU	+	-	-
WHOLESALE	-	-	+
RETAIL	+	-	-
FIRE	-	-	+
SERVICES	+	-	-
FED CIV	+	+	+
FED MIL	+	+	+
STATE + LO	-	-	+

SOURCE:
HERZOG AND OLSEN
AUTHOR

The above table indicates that ten of the fourteen industries in Monterey County hold a competitive advantage relative to the rest of the nation. Of those which hold a competitive advantage, only the agricultural industry, the federal civilian industry and the federal military specialize. Therefore a loss or reduction in any of those industries could have significant impact on the county's economy. Agriculture grew by 8,500 new jobs during the period 1980-1990, federal civilian employment grew by 1,700 jobs, and the federal military grew in the county by 600 positions.

The other seven industries with a competitive advantage are construction, mining, durable goods, non-durable goods, wholesale trade, FIRE, and state and local government. These industries do not specialize in the region so changes do not have as large an effect on the economy.

The other industry in the county which specializes is the food and kindred industry. However, because it does not hold a competitive advantage over the nation, a decline in this industry would not have a significant effect on the county.

Finally, the industries which neither specialize nor hold a competitive advantage are transportation and utilities, retail trade, and services. The collective effect of these industries on the county economy is significant, however the decline of individual industries would not greatly impact the county economy.

B. MULTIPLIER EFFECTS

Changes in employment and income produce direct or initial impacts on the levels of employment and income. However, because our economy is interdependent, a change in employment or income will induce further changes in employment or income in related areas of the economy. For example, a reduction in income in a county may result in less spending at local shops, which reduces the income to the shopkeeper, which in turn may reduce the income of the shop assistants. The impact of the

initial change has then been multiplied and that multiple of the direct change is called the multiplier.

1. Multiplier Theory

The economy of a region can be divided into two sectors - basic and non-basic. The basic sector comprises those industries which derive their demand outside the region, and the non-basic sector comprises those industries whose demand comes from within the region. Total activity is calculated as the sum of basic activity and non-basic activity. Multiplier theory states that the multiplier (M) for a particular activity is the ratio of total activity to basic activity. For example, the employment multiplier for a particular industry can be calculated as the ratio of total employment to basic employment. Thus, the employment multiplier may be used to determine the effect on total employment of changes in basic industry employment. Income can also be substituted into the activity formula, so that the income multiplier for particular industries may be calculated as the ratio of total income to basic income. The availability of income data for each industry is the major limitation to the calculation of income multipliers.

2. Input - Output Models

One of the major contributions of economic input-output analysis is the calculation of multipliers. Leontief [Ref. 18:p. 19] and Miernyk [Ref. 19:p. 8] describe input-

output analysis as a method of systematically quantifying the mutual interrelationships among the various sectors of a complex economic system. An input-output model measures the flow of some economic variable such as employment between all the individual sectors of the economy. The model calculates the relationship between the inputs and the outputs of the economy and produces the multiplier relevant to that variable in that economic system.

Multipliers for each industry and for regions can be calculated by entering region-specific data into these input-output models. These multipliers are then applied to the input data relevant to the economic system and the resulting outputs are measured in terms of the direct impacts and indirect or induced impacts of the inputs on the outputs.

An analysis of the direct and induced impacts of the Fort Ord closure on the Monterey County economy depends on the use of input-output models to calculate the specific county industry multipliers. These shall be identified in the next section.

C. EFFECTS OF FORT ORD DOWNSIZING ON MONTEREY COUNTY ECONOMY

The downsizing of Fort Ord is likely to have a significant impact on the economy of Monterey County. Data have been gathered by the Department of the Army on the likely changes to the Fort Ord base. These data are presented below and will

be the subject of further analysis later in this chapter and in the next chapter.

1. Employment

The US Department of Defense employs approximately 21,600 active duty military personnel in Monterey County. An estimated 14,357, or 66.5%, of the county's active duty military will relocate to Fort Lewis in Washington by 1995. An estimated 2,526, or 44.3%, of the county's 5,700 defense civilians will be retrenched or transferred by 1995. Other civilian jobs may be indirectly affected by the downsizing - these will be explored later.

2. Population

The US Army estimates that 17,040 military dependents will depart along with the 14,357 active duty military to Fort Lewis by 1995. This comprises 55.6% of the county's 1991 military population. Approximately half of the defense civilians and their dependents, or 3,501 people, are likely to leave the county by 1995 to seek employment elsewhere. Therefore, the county can expect a total population reduction of 34,913 or 9.7% of the county's 1991 population of 361,600 by 1995.

3. Housing

The exodus of 34,913 people from the county is likely to increase the number of vacant houses in the county. Approximately 4,777 on-base houses are expected to be vacated,

along with 3,672 military-occupied off-base houses. The 1,263 DoD civilian employees expected to relocate will also create housing vacancies.

4. Income

The levels of income associated with military and civilian employment at Fort Ord will be reduced significantly by 1995. Estimates of a reduction of $266 million in military payrolls and $56 million in civilian payrolls could result in an income reduction of $321 million in the county. Much of this income is currently spent in the local community, and therefore will not be spent in the county after 1995.

5. Schooling

Approximately 5,000 dependents of the departing military and civilian population attend schools in the county. The reduction of such a large number of students will cause loss of revenues to schools and reduction in teaching and support staff.

D. EXISTING STUDIES OF ECONOMIC IMPACTS ON MONTEREY COUNTY

The imminent downsizing of Fort Ord has prompted interested organizations to conduct their own impact studies of the effects of the downsizing of Fort Ord on Monterey County. The County of Monterey commissioned the Fort Ord Task Force to employ consultants to conduct a thorough analysis of the economic impacts on the county. The cities of Seaside and Marina also commissioned a team of consultants to conduct an

impact study of the effects on their cities of the Fort Ord downsizing. The US Army's Construction Engineering Research Laboratory has also developed a model to forecast the economic impacts of military bases on regions. This model will be applied to the available data later in the chapter.

1. The Fort Ord Task Force Study

The Fort Ord Task Force was appointed by the County of Monterey to report on the effects of the imminent closure or realignment of Fort Ord. An economic impact study was conducted by RKG Associates and was presented in June 1992 [Ref. 9]. The study looked in detail at the direct and indirect impacts on incomes and economic output, the county's labor market, and fiscal impacts on the communities. Data were collected from a variety of military, state, county, and private sources.

The study used employment and expenditure data from the U.S. Army. The data were analyzed directly and through the use of a computerized static regional input-output model called IMPLAN, which was designed by the United States Forest Service to estimate economic multipliers for all sectors of the economy [Ref. 20]. The major findings of the study are detailed below.

a. Population.

The county population is growing by 5,000 to 6,000 people or about 1.5% per year, however the loss of 35,000 people or 9.7% of the population means the loss of significant expenditure in the community.

b. Employment.

The loss of 14,357 military and 2,526 defense civilians could result in the indirect termination of an additional 4,073 civilian jobs in the county. This would be caused by the loss of salaries and wages and subsequent expenditures for goods and services in the community.

c. Incomes.

The direct income reduction for military and defense civilians is approximately $321.5 million per year, and indirect income losses from the community are expected to be $110.8 million. However, because of the multiplier effect, the total output loss is expected to be $377.3 million (direct) and $149.2 million (indirect). This means that the total economic impact to the community from income loss could be $526.5 million per year.

d. Cities Affected.

The cities of Seaside and Marina will be most affected by the downsizing. Marina could lose over $611,000 or 3% of its annual budget, and Seaside could lose over $1 million or 10.7% of its annual budget. Other cities could

expect to lose about 3% of their budgets, with the county losing over $3 million in revenues.

e. Schooling.

The Monterey Peninsula Unified School District is expected to lose 5,000 students, $22.5 million (33% of total budget) and can expect 600 teachers and support staff to be laid off.

f. Redevelopment Options

The study also presented a number of redevelopment options and their impact on the community. These options and impacts will be discussed later in this thesis.

2. Cities of Marina and Seaside Study

The cities of Marina and Seaside chose to commission their own consultants to study the effects of the Fort Ord downsizing on their cities. The study was conducted by Williams Kuebelbeck and Associates in early 1992. The study relied on data from federal, state and local agencies, and the US Army at Fort Ord. The methodology included use of a location quotient technique to calculate local competitive advantage compared to the state, use of shift share analysis to calculate industry growth compared to the state, and use of the Bureau of Economic Analysis input-output model to calculate the industry multipliers.

The study found that Fort Ord military and dependents comprise approximately 40% of the populations of Marina and

Seaside, which could mean that much of the economic activity in the two cities will cease when the downsizing occurs.

The results of the study have not yet been released to the public.

3. Construction Engineering Research Laboratory (CERL) Model

The Economic Impact Forecast System (EIFS) model was developed by CERL for the US Army as part of a computer-based environmental impact projection model to determine the impacts of the military on the environment and economies affected by military installations [Ref. 21].

The EIFS model accesses employment data from the US Bureau of the Census, and the model utilizes methodologies from the Bureau of Reclamation Economic Analysis Model (BREAM), the Regional Industrial Multiplier System (RIMS), and the Defense Logistic Agency Employment Impact System (DLAEIS) to maximize forecasting accuracy [Ref. 22].

The inputs required by the EIFS model include changes in military and civilian employment and their average incomes, the proportion of military living on-base, estimates of the proportion of civilians expected to relocate, and estimates of the change in expenditures for local supplies and services.

The outputs of the EIFS model are listed below in Table X.

TABLE X
MONTEREY COUNTY FORECAST IMPACTS
EIFS MODEL

IMPACT		AMOUNT DECREASE
CHANGE IN LOCAL SALES VOLUME	- DIRECT	$ 302,200,000
	- INDUCED	$ 277,100,000
	- TOTAL	$ 579,300,000
	- LOCAL CHANGE	14.284%
CHANGE IN LOCAL EMPLOYMENT	- DIRECT	17,716
	- INDUCED	5,607
	- TOTAL	23,323
	- LOCAL CHANGE	14.647%
CHANGE IN LOCAL INCOME	- DIRECT	$ 318,000,000
	- INDUCED	$ 101,600,000
	- TOTAL	$ 419,600,000
	- LOCAL CHANGE	8.216%
CHANGE IN LOCAL POPULATION	- TOTAL	39,568
	- LOCAL CHANGE	12.893%
CHANGE IN LOCAL OFF-BASE POPULATION		12,970
CHANGE IN NUMBER OF SCHOOL CHILDREN		7,663
CHANGE IN DEMAND FOR HOUSING	- RENTAL	2,955
	- OWNER OCCUPIED	1,984
CHANGE IN LOCAL GOVERNMENT EXPENDITURES		$ 31,157,000
CHANGE IN LOCAL GOVERNMENT REVENUES		$ 38,848,000
CHANGE IN LOCAL NET GOVERNMENT REVENUES		$ 7,691,000

SOURCE: CERL

IV. ALTERNATE FORECAST MODEL AND COMPARISON

The previous chapter outlined the use of shift-share analysis and input-output multipliers. The two existing models that were used to determine the effects of the Fort Ord closure on Monterey County use different input-output models to calculate multipliers.

Shift-share analysis can also be used to develop a multiplier. Young [Ref. 2:p. 140] described the method of using shift-share analysis to develop an average employment multiplier which can be used as a surrogate for other industry and income multipliers. The method described by Young was used in this study to develop an average employment multiplier for Monterey County. That multiplier can be used to form the basis of an alternate forecast model. This model can then be applied to the Fort Ord base closure data to determine an alternate forecast of the impact on Monterey County. A comparison of the three models can then determine which model is best suited to forecast the likely impact on Monterey County.

A. ALTERNATE FORECAST MODEL

1. Multiplier Calculation

The average employment multiplier for a region is calculated as the ratio of the change in total employment to the change in basic employment activity. The change in

Monterey County total employment from 1980 to 1990 was +33,900. The change in county basic employment calculated from shift-share analysis is postulated to be the sum of the regional share effect (S) and the regional allocation effect (A). Table XI presents the changes by industry from 1980 to 1990 in county total employment as well as county basic employment, calculated as the sum of S and A.

TABLE XI
BASIC EMPLOYMENT
SHIFT-SHARE TECHNIQUE
MONTEREY COUNTY
1980 - 1990

INDUSTRY	TOTAL EMPLOYMENT CHANGE	SHARE EFFECT S	ALLOC EFFECT A	BASIC EMPLOYMENT CHANGE S + A
AGRICULTURE	8500	1968	7905	9873
CONSTRUCTION	1300	1416	- 642	774
MINING	- 100	66	- 46	20
DUR MFG	1300	10589	-9050	1539
NON-DUR MFG	400	2157	-1569	588
FOOD +	- 200	- 118	- 82	- 200
TCPU	- 500	-1620	407	-1213
WHOLESALE	2000	3144	-1705	1439
RETAIL	5500	- 432	25	- 407
FIRE	1900	1019	- 386	633
SERVICES	9100	-2707	531	-2176
FED CIV	1700	644	552	1196
FED MIL	600	222	1395	1617
STATE+LOCAL	2400	182	-16	166
TOTAL	33900	+16530	-2681	+13849

SOURCE:
AUTHOR

As described above, the average employment multiplier is calculated as the change in county total employment divided by the change in county basic employment:

$$\text{Average Employment Multiplier} = \frac{33900}{13849} = 2.448$$

2. Development of Impact Forecast Model

The average employment multiplier calculated above is useful in the development of an alternate impact forecast model. A multiplier is applied to input data to determine the likely effects that a change in inputs will have on a region. Although the multiplier is an average of the industries in the region, it can be used to forecast an approximation of the total change in employment and other business and community activity in a region.

The average employment multiplier of 2.448 calculated for Monterey County can therefore be used to forecast the approximate impacts that the Fort Ord base closure will have on the county region. The methodology used in the calculation of the alternate forecast model was the same as that used by CERL to calculate the EIFS model outputs [Ref. 13:pp. 86-98]. The general concept of the calculations of each of the alternate model's outputs are detailed below.

a. Business Volume

The proposed method of calculating the direct change in business volume, which is total sales in the county,

is to add the Army's local expenditure on supplies and services to the local expenditure by Fort Ord military and civilian employees. Military members are assumed to spend 50% of their salary off-base in the local community, and civilian employees are assumed to spend all of their salary locally. The multiplier is then applied to the direct change in business volume to forecast the total change in business volume in the county. The indirect or induced change in business volume is the difference between the direct change and the total change in volume.

b. Local Employment

The change in local employment can be forecast by using the average employment multiplier. For each job lost or gained, the multiplier predicts that 2.448 other jobs will be lost or gained in the county. Therefore, the change in local employment is calculated by multiplying the number of jobs lost in the base closure by the employment multiplier. The induced change in local employment is the difference between the total and direct changes in employment.

c. Personal Income

The change in personal income is the sum of the direct change in personal income plus the induced change in personal income. The direct change in personal income is the wages and salaries of the military and civilian personnel cut from Fort Ord. The induced change in personal income is

calculated as the induced change in local employment multiplied by the average civilian income in the county.

d. Local Population

The change in local population is forecast to be the sum of departing military families and departing civilian employees. The number of departing military and an estimate of departing civilians employed by the Army has been provided by the Army. Other civilian employees are also expected to leave the county. The estimate of these additional leavers is calculated as one half of the induced change in employment.

e. Off-Base Population

The change in off-base population is calculated as the total of the off-base military and civilian personnel likely to leave the county multiplied by the average employment multiplier. The number of off-base military personnel and dependents is 25.6% of the total number of military and dependents employed at Fort Ord. The change in civilian off-base population was assumed to be the same as the change forecast for the civilians in the local population above.

f. School Children

The change in the number of school children was calculated to be a proportion of the change in local population. The national average of 1.5 school children per family was adopted here [Ref. 13:p. 93], so 43% of the

departing family population are expected to be school children. Approximately half of the departing population are likely to be single without dependents. Therefore, the change in school children was estimated to be 43% of half of the change in local population.

g. Demand for Housing

The change in demand for housing was assumed to be a function of the departing off-base population. The off-base population comprises families and single people. An estimate consistent with the EIFS model is that the change in demand for housing is approximately 40% of the change in the local off-base population.

h. Local Government Net Revenue

The change in local government net revenue is the difference between government revenue and expenditure in the county. Government revenues are made up of property taxes, sales taxes and state subventions on a per-capita basis. Government expenditures include police, welfare, sanitation, public transport, and many other agencies. Many of those expenditures are not directly linked to population as are revenues, so it was expected that government net revenues would decrease with a population decrease. A forecast of the change in government net revenue was calculated as the sum of the expected reduction in sales tax revenue and the estimated reduction in state subventions to Monterey County.

3. Alternate Model Impact on Monterey County

The alternate model developed above can be used to measure the impact of the Fort Ord base closure on Monterey County. The model was developed specifically to assist interested parties without detailed knowledge of computers, modems and input-output analysis to forecast the approximate impacts of a base closure on a region. The results from this model will be compared to the results obtained by the other more sophisticated models later in this chapter. Therefore, the same input data, obtained from the Army and other sources, which was used in the other models in Chapter III, are used to determine the impacts on the Monterey County economy.

a. Input Data

The input data used in the alternate impact forecast model are:

Change in military expenditure for local supplies and services:	- $55,800,000
Change in civilian employment:	- 2,526
Average income of affected civilians:	$21,091
Percent of civilians expected to relocate:	50%
Change in military employment:	- 14,357
Average income of affected military personnel:	$18,500
Percent of military personnel living on base:	74.4%
Average employment multiplier:	2.448

b. Alternate Impact Model Output

The outputs obtained by performing the calculations and estimates included in the alternate impact forecast model are detailed in Table XII.

TABLE XII
MONTEREY COUNTY FORECAST IMPACTS
ALTERNATE IMPACT MODEL

IMPACT		AMOUNT
CHANGE IN LOCAL SALES VOLUME	- DIRECT	- $244,700,000
	- INDUCED	- $354,300,000
	- TOTAL	- $599,000,000
CHANGE IN LOCAL EMPLOYMENT	- DIRECT	- 16,883
	- INDUCED	- 24,446
	- TOTAL	- 41,329
CHANGE IN LOCAL INCOME	- DIRECT	- $321,800,000
	- INDUCED	- $515,590,000
	- TOTAL	- $837,390,000
CHANGE IN LOCAL POPULATION		- 47,136
CHANGE IN LOCAL OFF-BASE POPULATION		- 23,774
CHANGE IN NUMBER IF SCHOOL CHILDREN		- 10,134
CHANGE IN DEMAND FOR HOUSING		- 9,510
CHANGE IN LOCAL GOVERNMENT NET REVENUE		- $9,690,000

SOURCE:
AUTHOR

B. COMPARISON OF FORECAST MODELS

This study used three impact forecast models to assess the effect of the closure of Fort Ord on the Monterey County economy. The EIFS model, the IMPLAN model and the alternate model produced different output results, despite the same input data. The EIFS and IMPLAN models produced results consistent with each other, however the alternate model developed in this study forecast significantly larger impacts on the community. A summary of each model's forecasts is

detailed in Table XIII below. A comparison of the forecasts of each model and possible reasons for the differences follows the table.

TABLE XIII
MONTEREY COUNTY FORECAST IMPACTS
COMPARISON OF MODELS
($ IN MILLIONS)

LOCAL IMPACT CHANGE			AMOUNT DECREASE EIFS	IMPLAN	ALTERNATE
SALES VOLUME	- DIRECT	$	302.2	377.3	244.7
	- INDUCED	$	277.1	149.2	354.3
	- TOTAL	$	579.3	526.5	599.0
EMPLOYMENT	- DIRECT		17,716	16,883	16,883
	- INDUCED		5,607	4,073	24,446
	- TOTAL		23,323	20,956	41,329
PERSONAL INCOME	- DIRECT	$	318.0	321.5	321.8
	- INDUCED	$	101.6	110.8	515.6
	- TOTAL	$	419.6	432.3	837.4
POPULATION			39,568	34,913	47,136
OFF-BASE POPULATION			12,970	10,529	23,774
SCHOOL CHILDREN			7,663	5,000	10,134
HOUSING DEMAND			4,939	4,935	9,510
GOVERNMENT NET REVENUE		$	7.7	3.0	9.7

SOURCES:
CERL, RKG ASSOCIATES, AUTHOR

1. Forecast Output Comparison

Each model produced a different output for each forecast category. The output forecast results for each category are compared below, along with possible reasons for the differences.

a. Sales Volume

Each model forecasts a decrease in total county sales volume of between $500 and $600 million. The main differences between the models lie in the interpretation of

which effects are direct or induced and the size of the multiplier used. The EIFS model calculates direct sales volume to include 70% of military salary, then applies an export income multiplier of 1.917 to obtain the change in total sales volume. The IMPLAN model output overstates direct sales volume, but compensates for this by using a smaller sales multiplier of 1.395. The alternate model measures the direct change in military and civilian expenditure in the community to include 50% of military salary, then the average employment multiplier of 2.448 is applied to obtain the change in total sales volume. While the methods differ, the results are quite similar.

b. Employment

The forecast change in county employment is similar for the EIFS model at 23,323 and the IMPLAN model at 20,956. These differences were caused by the different time periods used by each model to calculate their industry-specific employment multipliers. The alternate model produced a significantly larger employment reduction of 41,329. This was due to the average employment multiplier for the county of 2.448 being applied to the number of military and civilian jobs to be reduced. This revealed a problem with using an average employment multiplier instead of industry-specific multipliers used in the other two models. The average employment multiplier assumes that a change in military

employment has the same effect on the community as a change in employment in other industries. In reality, changes in military employment do not impact the community as much as changes in other industries due to the partial segregation of many military families from the community. Therefore the alternate model overstates the change in employment in the county.

c. Personal Income

The impact on employment of the average employment multiplier in the alternate impact model has a significant flow-on effect on the change in personal income. As the alternate model's forecast includes the change in civilian employment multiplied by the average civilian income for the county, the change in personal income is greatly overstated at $837 million. The EIFS and IMPLAN models produced similar output results, with the IMPLAN model forecasting the larger reduction in personal income of $432 million compared to $419 million. This was the only category for which the IMPLAN model forecast a larger output result than the EIFS model.

d. Population

The change in population for each model is calculated as a function of the change in employment. The EIFS model forecast a larger population loss (39,568) than the IMPLAN model (34,913) due to the slightly larger EIFS forecast employment reduction. The alternate model forecast a much

larger population loss of 47,136 due to its significantly larger forecast employment reduction.

e. Off-Base Population

The change in off-base population is consistent with the change in county population for each model. The EIFS model forecast a reduction of 12,970 off-base personnel, compared to the IMPLAN model forecast of 10,529. The alternate model forecast a reduction of 23,774 off-base personnel due to the larger forecast employment reduction.

f. School Children

The reduction in the number of school children attending county schools differs significantly for each model. The EIFS model forecast a reduction of 7,663 school children, whereas the IMPLAN model forecast a reduction of 5,000 students and the alternate model forecast a reduction of 10,134 students. These differ due to each model's dependence on using population reduction as the indicator for the change in school enrollments.

g. Housing Demand

The demand for housing in the general community is expected to decline as a result of the closure of Fort Ord. The EIFS model predicts that housing demand will decrease by 4,939, and the IMPLAN model forecasts that 4,935 houses will be vacated due to the base closure. The alternate model forecasts a reduced housing demand of 9,510, which is higher

than the other models due to the expected departure of a larger segment of the employed civilian community.

h. Government Net Revenue

Government net revenue is expected to decrease due to the elastic nature of government revenue compared to the inelastic nature of government expenses. The EIFS model forecasts a reduction of $7.7 million, the IMPLAN model predicts a reduction of $3.0 million, and the alternate model forecasts a reduction of $9.7 million. These results differ considerably due to the nature of each model. The EIFS model considers a large range of expenditure programs and revenues, whereas the IMPLAN model includes the reductions in population-related and tax-related revenues. The larger net revenue reduction forecast by the alternate model is due to the larger reduction predicted in the county's population, employment and sales tax revenue.

2. Model Comparison

The three models have been described in limited detail in various parts of this study. Each uses sufficiently varied methodology and techniques that the forecasted impacts of the same input data produce significantly different outputs. The major differences between the EIFS and IMPLAN models are the input-output analysis techniques used and the database sources accessed. The alternate impact model developed in this study differs significantly from the other models in that it does

not access sophisticated input-output models; instead it uses an average employment multiplier.

a. EIFS Model

The EIFS model, developed by the Army's CERL, uses the RIMS input-output analysis, the BREAM model, and the DLAEIS model to assess the impact of military bases on regional economies and the environment. The industry-specific multipliers used in the RIMS analysis and DLAEIS have been developed to account for the special impacts the military has on the economy and the environment. The EIFS model has been regularly upgraded to include current technology and economic data to maximize forecasting accuracy. The EIFS model is administered by the University of Illinois, however free access to the model is available to and is widely used by military planners and researchers. The model is becoming recognized by industry and researchers as a powerful tool for economic impact assessment [Ref. 21].

b. IMPLAN Model

The IMPLAN model was developed by the United States Forest Service to estimate economic multipliers for all sectors of the economy. The model is regularly upgraded with current data and technology and provides industry-specific multipliers, however the model's input and output data require further manipulation to produce forecasts of military-specific impacts on regional economies. The IMPLAN model is

administered by the University of Minnesota, and is available to subscribers at a cost of between $100 and $25,000 depending on the databases desired. It is widely used by economic impact planners in industry, government and research establishments [Ref. 19].

c. Alternate Impact Model

The alternate economic impact forecast model developed in this study is useful in determining the general impacts of military bases on regional economies. The shift-share analysis approach to developing an average employment multiplier is not as sophisticated as the computer-based input-output analysis multipliers, however it does provide an acceptable means to develop an inexpensive, approximate economic impact forecast model.

d. Model Comparison Summary

The EIFS model is considered the most useful, inexpensive and accurate model to assess the impacts of military bases on regional economies. The IMPLAN model does not address the military-specific aspects of military bases without significant further manipulation. The alternate impact model developed in this study is a useful tool for assessing the approximate impacts of military bases on communities, however the EIFS model is considered superior. The EIFS model

will therefore be used in the next chapter to assess some redevelopment options for the Fort Ord base.

V. IMPACTS OF REDEVELOPMENT OPTIONS

The previous chapters have revealed that the closure of Fort Ord military base is likely to have significant negative economic impacts on the Monterey County economy. However, the impact models which were used forecast the likely scenario as if the changes occurred overnight, instead of over a multi-year period which is possible. Therefore, the size of the actual impacts are likely to be smaller than the models forecast. In reality, the impacts would occur over a period of time as the current plan is to phase out the units at Fort Ord gradually and move those units to Fort Lewis in Washington over a two year period.

The impacts are also likely to be further reduced as redevelopment of the Fort Ord land and facilities begins to occur. Many redevelopment ideas have been produced and presented in open forums, the media, and task force reports. Some of those ideas are being seriously considered as options for redevelopment of the base. It is not within the scope of this study to analyze the advantages and disadvantages of each of the redevelopment options being considered by the relevant authorities, however the economic impacts of some of those redevelopment options can be forecast using the EIFS model.

This chapter describes some possible redevelopment options and their economic impacts on the Monterey County economy.

A. POSSIBLE REDEVELOPMENT OPTIONS

Fort Ord comprises about 28,500 acres of land extending several miles inland from Monterey Bay. The base occupies prime real estate in a county where real estate values are some of the highest in the nation. Despite the prediction of short-term negative economic impact, the Monterey area has natural attributes such as beauty, temperate climate and excellent recreational facilities which have made the area a major tourist attraction. Those attributes should assist in the area's long-term economic recovery.

History is also in favor of an economic recovery. Many former bases have been converted to a wide range of uses: industrial parks, medical centers, local government offices, municipal airports, training facilities, prisons, parks and recreation facilities, and shopping centers. A 1986 study by DoD of 100 base closures revealed that the civilian jobs created in the process of base conversion more than replaced those jobs that were lost [Ref. 23:p. 27].

One aspect of the military base which will hinder full economic redevelopment of the area is that 10,000 acres of the base (36 percent), comprising beachfront and inland training areas, requires extensive environmental cleanup. Environmental

experts have estimated that those areas will not be fit for redevelopment until 1997 to 2003. The Army also plans to retain 1,299 acres (5 percent) of the property as an enclave. However, the other sectors of the base can be redeveloped and DoD, Army, state, county, and city officials are deep in consultation regarding the best use of the land. Two of the options and their likely effects on Monterey County are detailed below.

1. Option #1: Education, Science, and Technology Research Center

The principal recommendation of the Fort Ord Task Force [Ref 9:p. x] detailed the reuse of the base as an education, science, and technology research center, to be called the Monterey Bay Education, Science, and Technology Center (M-BEST). A joint venture of a 25,000 full-time student campus of the California State University system and a University of California science and technology research park would result in the creation of 5,650 jobs in the short term and 8,400 jobs in the long term at an average annual income of $46,000. When combined with the influx of 25,000 students and families, the potential positive economic impacts on the county are encouraging.

As the EIFS model uses current data, the direct military effects of the base closure must also be included as inputs to the model to determine a realistic forecast for

redevelopment option #1. The EIFS forecast output for option #1 is detailed below in Table XIV.

TABLE XIV
DEVELOPMENT OPTION #1
EDUCATION, SCIENCE, AND TECHNOLOGY RESEARCH CENTER
IMPACT ON MONTEREY COUNTY
EIFS FORECAST

IMPACT		AMOUNT
CHANGE IN LOCAL SALES VOLUME	- DIRECT	$ 132,297,000
	- INDUCED	$ 121,313,000
	- TOTAL	$ 253,610,000
	- LOCAL CHANGE	+6.253%
CHANGE IN LOCAL EMPLOYMENT	- DIRECT	1,471
	- INDUCED	-7,135
	- TOTAL	-5,664
	- LOCAL CHANGE	-3.557%
CHANGE IN LOCAL INCOME	- DIRECT	$ 23,022,000
	- INDUCED	$ 25,710,000
	- TOTAL	$ 48,732,000
	- LOCAL CHANGE	+0.953%
CHANGE IN LOCAL POPULATION	- TOTAL	-5,749
	- LOCAL CHANGE	-1.873%
CHANGE IN LOCAL OFF-BASE POPULATION		30,672
CHANGE IN NUMBER OF SCHOOL CHILDREN		-696
CHANGE IN DEMAND FOR HOUSING	- RENTAL	3,865
	- OWNER OCCUPIED	1,042
CHANGE IN LOCAL GOVERNMENT EXPENDITURES		- $ 651,000
CHANGE IN LOCAL GOVERNMENT REVENUES		- $ 6,771,000
CHANGE IN LOCAL NET GOVERNMENT REVENUES		- $ 6,120,000

SOURCE: CERL

2. Option #2: Economic Development Projects

The Fort Ord Task Force's Economic Development Advisory Group considered 25 separate concepts for implementation. Full support was endorsed for 15 of those proposals; the main project proposed was the M-BEST proposal mentioned above as option #1. Six of the other 14 proposed

projects were grouped together as a collective proposal of innovative ideas which would diversify the use of base assets to maximum advantage. The six projects include: a global competitive agricultural center; an educational conference center; high technology manufacturing industry; expanded aquaculture industry; enhanced telecommunications activities; and an international trade resource center.

The estimated impact of the six economic development projects includes the creation of 1,625 jobs in the short term and 12,435 jobs in the long term at an average annual income of $30,000. Table XV shows the impacts on the county of the six economic development projects.

TABLE XV
REDEVELOPMENT OPTION #2
ECONOMIC DEVELOPMENT PROJECTS
IMPACT ON MONTEREY COUNTY
EIFS FORECAST

IMPACT		AMOUNT
CHANGE IN LOCAL SALES VOLUME	- DIRECT	$ 103,530,000
	- INDUCED	$ 100,783,000
	- TOTAL	$ 204,313,000
	- LOCAL CHANGE	7.257%
CHANGE IN LOCAL EMPLOYMENT	- DIRECT	1,707
	- INDUCED	-2,883
	- TOTAL	-1,176
	- LOCAL CHANGE	-0.739%
CHANGE IN LOCAL INCOME	- DIRECT	$ 26,717,000
	- INDUCED	$ 16,528,000
	- TOTAL	$ 43,245,000
	- LOCAL CHANGE	0.846%
CHANGE IN LOCAL POPULATION	- TOTAL	-2,395
	- LOCAL CHANGE	-1.281%
CHANGE IN LOCAL OFF-BASE POPULATION		19,728
CHANGE IN NUMBER OF SCHOOL CHILDREN		2,483
CHANGE IN DEMAND FOR HOUSING	- RENTAL	5,573
	- OWNER OCCUPIED	2,069
CHANGE IN LOCAL GOVERNMENT EXPENDITURES		$ 5,723,000
CHANGE IN LOCAL GOVERNMENT REVENUES		- $ 7,099,000
CHANGE IN LOCAL NET GOVERNMENT REVENUES		- $ 12,822,000

SOURCE: CERL

B. IMPACTS OF REDEVELOPMENT OPTIONS

There are many options under consideration by county, city and Army officials for the redevelopment of Fort Ord. The two options which have been considered in this study show that a positive net economic impact is possible when the relevant input data are applied to the EIFS forecast model.

The EIFS model forecasts that the first option of a university and research center will create 13,000 new jobs in the community and draw up to 25,000 new students to the region. Despite losing the 16,000 military and civilian jobs on base, the local sales volume should increase by $253 million, local personal income should increase by $49 million, and the local off-base population should increase by 30,000 requiring an extra 4,800 homes. The number of school children is expected to decrease by 700 due to the outflow of military families, and the local government should expect to lose up to $6 million in net revenue. Most of these economic impacts on the region are positive due to the extra civilian income and employment base. Most of this income is returned to the community in the form of sales and investment, whereas half of the county's previous military income was spent on-base and did not benefit the community.

The EIFS model forecast of the second option's impact on the community is similar to the first. Off-base population is expected to increase by 20,000 requiring an additional 7,000 homes, and local personal income is likely to increase by $43 million creating an increase in total sales of $204 million. The extra 12,000 civilian jobs created should result in an increase of 2,500 school children, which will contribute to a decrease in local net government revenue of $12 million.

In summary, the EIFS model forecast demonstrates how the local economy can be improved by both options considered in

this study. The closure of Fort Ord will have a negative impact on the local economy in the short term, however when the redevelopment plans are implemented the community will benefit in the long term.

VI. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

This research has reviewed the history of military base restructuring and the literature on regional economic impact analysis. Many military bases have closed or restructured since the 1960's and DoD is responsible for the measurement and reporting of the environmental and economic implications of base restructuring. Chapter II also surveyed the academic research into regional economic impact analysis which revealed numerous theories and techniques applicable to base restructuring.

The analysis technique selected from among these theories and techniques was Shift Share Analysis, which was applied in Chapter III to the data collected on the Monterey County economy. Military personnel, their dependents, and civilians employed by the military form a significant part of the economy. Two commercially available economic impact forecast models, IMPLAN from the University of Minnesota and EIFS from the Army's CERL, were then applied to the Monterey County data to determine the impact on the county of the base closure at Fort Ord. The results obtained forecast a large negative impact on the county economy in the form of reduced employment (23,000 jobs), $579 million less in retail and

wholesale sales, 40,000 fewer population, 7,000 fewer school children, and 5,000 fewer houses demanded.

An alternate economic impact model was then developed in Chapter IV using a multiplier derived from the Shift Share Analysis technique. The alternate model was applied to the county data, and the economic impacts were compared to the impacts obtained from the other two models. The alternate model forecasted consistently larger impacts on the county economy than the other two models due to the larger multiplier developed by the shift share technique. The Army's EIFS model was selected as the model best suited to measure impacts of base closures on local economies on the basis of availability, applicability, simplicity, and cost.

The EIFS model was then applied to two redevelopment options for the base land and facilities recommended by the Fort Ord Task Force. The results indicated that the county economy would improve greatly in the long term under each option, after an initial slump in the short term, to surpass the current economic level in civilian employment, income, sales, and off-base population.

The EIFS and other economic impact models are very useful for forecasting approximate effects on a community or region, however the models are static models which do not consider time. Each forecast assumes that the changes in population, employment, spending and demand occur instantaneously. In

reality, changes occur over time, so these models should be used with care and understanding of the time consideration.

B. RECOMMENDATIONS

This thesis has identified a number of useful models for calculating impacts and methods for developing multipliers. The following recommendations are presented to assist future researchers in this topic area:

1. The EIFS model developed by the Army's CERL and administered by the University of Illinois should be used to determine the impacts of changes to military bases on regional economies.

2. The Shift Share technique of developing average industry employment multipliers should be the subject of further research.

3. The development of an economic impact forecast model which takes into account the time element of changes to the inputs and outputs should be the subject of further research.

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